



RESPONSE TIME TESTING

of Nuclear Plant Thermocouples and Pressure Transmitters

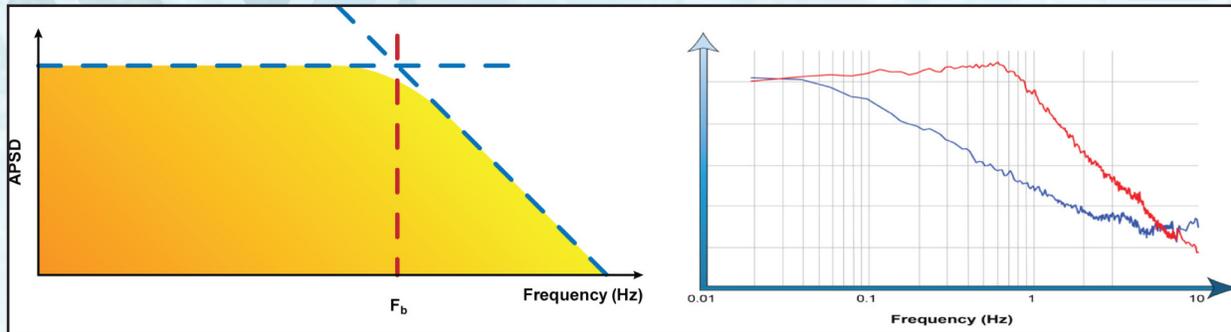


Figure 1. Illustration of Frequency Response of a First Order System and Actual Nuclear Plant PSDs

The response time of thermocouples as well as pressure, level, and flow transmitters in nuclear power plants can be verified passively and remotely using the “noise analysis” technique. The noise analysis technique uses the output of an Instrumentation and Control (I&C) channel (sampled at 1000 Hz or more) to provide its dynamic response. More specifically, the noise analysis technique is based on monitoring the natural fluctuations (noise) that exist at the output of sensors while the plant is operating (Figure 1). These fluctuations are due to turbulence induced by the flow of water in the system, random heat transfer in the core, and other naturally occurring phenomena. The noise is extracted from the sensor output by removing the DC component of the signal and amplifying the AC component, and is then analyzed to provide the dynamic performance of the sensor.

The online testing for response time of thermocouples and pressure transmitters in nuclear power plants involves a set of equipment consisting of a data acquisition system and computer. The equipment is setup in the control room area or other locations where the sensor output signals can be accessed through the current loops in the plant instrumentation cabinets. The tests are normally performed while the plant is at normal operating conditions.

Featured Benefits

- Passive Measurement That Can Be Used to Verify Response Time of Thermocouples and Pressure, Level, and Flow Transmitters
- Does Not Interfere With Plant Operation
- Does Not Involve Radiation Exposure to Maintenance Personnel
- Can Be Performed Simultaneously on Several Sensors at a Time
- Provides Diagnostic Information About the Health of Transmitter Sensing Lines (Blockages, Voids, & Leaks)

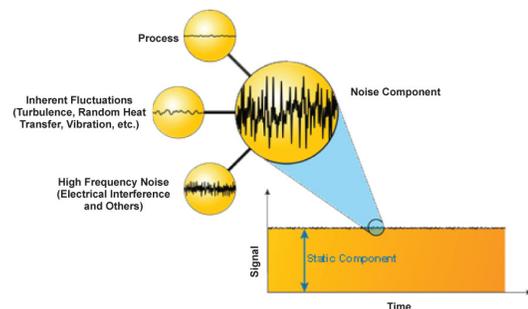


Figure 2. Illustration of Noise on the Output of a Pressure Transmitter

10CFR50 Appendix B Program

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